Integrated protection of fruit crops
Subgroup "Soft Fruits"
IOBC-WPRS Bulletin Vol. 109, 2015
pp. 95-97

The potential for mass trapping *Lygus rugulipennis* and *Anthonomus rubi*; trap design and efficacy

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The strawberry blossom weevil, *Anthonomus rubi*, and the European tarnished plant bug, *Lygus rugulipennis*, cause significant damage to strawberry crops. The former lays an egg in a developing flower bud and then partially severs the peduncle, resulting in a loss of yield. The latter feeds on flowers and developing fruitlets, causing fruit distortion, and renders the fruit unmarketable. Organic crops are vulnerable because many of the insecticides used to control the pests are not approved in organic growing systems. Pheromone traps are available for both species and are used routinely in UK strawberry crops for pest monitoring and targeting applications of plant protection products. The attractant for *A. rubi* is composed of the male aggregation pheromone and a plant volatile (Innocenzi *et al.*, 2001; Cross *et al.*, 2006 a,b; Wibe *et al.*, 2014). The attractant for *L. rugulipennis* is a male produced sex pheromone (Innocenzi *et al.*, 2004, 2005; Fountain *et al.*, 2014). Phenylacetaldehyde can be added to encourage the capture of female *L. rugulipennis* (Fountain *et al.*, 2010; Koczor *et al.*, 2012). Standard bucket traps (Unitraps) with green cross-vanes (bucket 16 cm dia., 12.5 cm high with 3 cm dia. opening; cross vanes 10 cm high with cover 16.5 cm dia.) are used to capture both species in water and detergent.

As part of a project to develop multispecies traps for insect pests in strawberry and raspberry ("Softpest Multitrap"), we investigated whether the *A. rubi* and *L. rugulipennis* traps could be combined including studies on trap design. Studies were carried out in Denmark, Norway, Latvia, Switzerland and/or the UK comparing the effect of the trap design on target capture and the effects on beneficial species.

Ten trap designs were tested (2012). Five traps had water and detergent and 5 had sticky glue to capture the insects. The former were either cross vane bucket traps with white or green cross vanes, with or without a bee excluding mesh, or a prototype 30 ml plastic pot with a white plastic insert to intercept flying insects. Sticky traps were made of different coloured cards with wet or dry glue, a wooden stake and a stored grain pest trap with wet glue. Randomised complete block designs comprising 5 replicates of each treatment were done for each species. Plots were single traps deployed in lines spaced 20 m apart on the ground along the edges of strawberry or alfalfa fields.

In the second test we examined the effect of cross vane height (2013). Cross vanes were either full height, double height or no cross vane for *L. rugulipennis* and full height, half height or no cross vane for *A. rubi*. Bucket traps contained water plus a drop of detergent. Experiments were randomised complete block designs with 10 or 6 replicates per treatment. Plots were single traps deployed in rows spaced 10 m on the ground.

Cross vane funnel bucket traps with water and detergent captured significantly more *A. rubi* than sticky traps. *L. rugulipennis* catches were higher in the cross vane traps, but catches were impeded by the bee excluder grid. There were fewer of the target pest species captured on sticky traps and these devices tended to capture significantly more by-catch (e.g. Diptera) including beneficial insects, e.g. spiders and Carabidae. In the second experiment, the height of the green cross vane had no effect on the numbers of male *L. rugulipennis* trapped in the funnel traps. However, the higher cross vanes captured more coccinelids and opiliones. In the *A. rubi* trials there were significantly more individuals in the full height cross vane compared to the half-height or no cross vane treatments.

Hence, the most effective trap for *A. rubi* and *L. rugulipennis* is a green Unitrap with no bee excluder grid. We are currently testing this device for mass trapping of both pests.

Key words: *Anthonomus rubi, Lygus rugulipennis*, mass trapping, pheromone

Acknowledgement

This project (249667) was funded by CORE Organic II Funding Bodies (FP7 ERA-Net project, CORE Organic II.

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